Natural Sciences and Engineering Research Council of Canada

NSERC's Awards Database

Award Details

Tools development: Manufacturing lightweight composite insulators for electricity distribution and rail systems

Research Details

Competition Year:	2015	**Fiscal Year:**	2015-2016
Project Lead Name:	Bhiladvala, Rustom	**Institution:**	University of Victoria
Department:	Mechanical Engineering	**Province:**	British Columbia
Award Amount:	$25,000	**Installment:**	1 - 1
Program:	Engage Grants Program	**Selection Committee:**	Pacific Internal Decision Committee
Research Subject:	Mechanical engineering	**Area of Application:**	Energy storage and conversion
Co-Researchers:	No Co-Researcher	**Partners:**	ASAsoft (Canada) Inc.

Award Summary

A major fraction of the energy used in industry, residential and office buildings, and electric rail transit, is transmitted from electric power generating stations over a network of high-voltage power lines. The high voltage lines are well-insulated, usually by a set of ceramic disks, a familiar sight of brown glazed porcelain on neighbourhood utility poles. While this material itself has excellent insulating properties, such insulators are made by a long, energy-intensive process. and identical replacements are costly. They are reported to be frequent targets of vandalism. Small air gaps between the brittle insulator and metal pins, due to cracks or imperfections can lead to visible discharge when electricity jumps across gaps with ionized air. This causes electromagnetic noise in a wide range of frequencies, including the radio-frequency (RF) range used for Wi-Fi, cellphone, internet, radio and TV transmission. RF-disruption near power lines is currently a nuisance in many urban areas. Smart grids for more efficient energy usage, as well as roadway signalling and other city planning for the future rely on increasing rates of critical information transmission in the RF-range, which would make RF-disruption a candidate for serious public safety problems. This proposal seeks to develop tools to help in the design and manufacture of competitive insulators for new installations and replacements. Such insulators employ composite materials, including polymers, which can provide the same insulation for a fraction of the weight, and are likely to be less susceptible to cracks, debonding, vandalism, and RF-disruption. We would like to quantify and improve the energy advantage in the life-cycle of such insulators, compared to porcelain insulators. The high-voltage testing of full-scale insulators is a necessary final step for safety. However, materials and design questions leading to manufacture can be more systematically, quickly and inexpensively studied by small-scale experimental laboratory analogues. Here we seek to evaluate such a scaled-down system for power line insulator development.

Date Modified: 2016-02-10